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## PATENT ABSTRACTS OF JAPAN

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**H01L 33/00**(21) Application number: **60165579**(71) Applicant: **MINOLTA CAMERA CO LTD**(22) Date of filing: **25.07.85**(72) Inventor: **MATSUI TORU**(54) **LIGHT COLLECTING STRUCTURE OF LIGHT  
EMITTING DIODE**

condensed solely to a chip, emitted from the upper surface to be optimum for a point light source.

(57) Abstract:

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**PURPOSE:** To condense upper and side surface light by providing a groove which is deeper than a P-N junction and has oblique surfaces on a chip surface formed with P-N junction of an LED.

**CONSTITUTION:** The upper surface 5 and the bottom 6 of an LED chip 4 are parallel to a P-N junction 7, and an upper surface electrode 8 has an area smaller than a lower surface electrode 9. A groove 10 of V-shaped section is annularly formed around the electrode 9. The groove 10 is deeper than a P-N junction 7, the oblique surface 10a is formed 45° to the P-N junction, and the end of the groove is of the degree that a light emitting portion is slightly projected. According to the construction, the light 11 parallel to the P-N junction 7 and lightly inclined lights 12, 13 are fully reflected upward on the surface 10a, emitted from the upper surface 5, the light propagated substantially perpendicularly from the junction is emitted directly from the upper surface, and when the electrode 9 is formed of a highly reflecting material, the light which is propagated downward is reflected upward. According to the construction, the upper and side surface light is

